AP Lab 1: Basic Laboratory Equipment and Procedures

In order to have a productive year in the laboratory, it is necessary that you become familiar with the apparatus that you will be using this year. This experiment is divided into two sections, in which you will light and adjust the laboratory burner, use a balance, measure liquids, and measure temperature. It is important that all safety precautions be observed whenever you perform an experiment and use any apparatus.

Part 1: Measuring Volumes of Liquids

Accuracy and precision are important when handling materials and taking measurements in chemistry. This section will illustrate the importance in using the appropriate instrument to measure volume.

Apparatus and Materials

graduated cylinders: 10, 100 mL beaker: 100 mL pipettete: 10 mL pipettete bulb

water

Procedure

1. Obtain approximately 45 mL of water in the 100 mL beaker. Pour the water into the 100 mL graduated cylinder.

2. Read the volume in the graduated cylinder, to the nearest 0.1 mL. If there is a meniscus (curved surface), the recorded volume should be the bottom of the meniscus. Record this value.

3. Repeat the procedure using a 50 mL graduated cylinder.

4. Once again obtain some water in the 100 mL beaker. Use the pipette bulb to draw water into the pipette until the water level is a little above the 10.0 mL mark on the pipette.

5. Gently allow the water level to drop slowly until the bottom of the meniscus is exactly on the line.

6. Allow the water to drain from the pipette into the 10.0 mL graduated cylinder, avoid touching the tip of the pipette to the side of the cyclinder as the water drains from the pipette. Record the water level in the graduated cylinder.

7. Clean up by dumping all the water down the drain. Glassware may be put away wet.

NO MOUTH PIPETTING IS ALLOWED!
DO NOT "BLOW OUT" THE REMAINING WATER. THESE PIPETTES ARE DESIGNED TO LEAVE A SMALL AMOUNT OF LIQUID IN THE TIP.

Questions:

1. How accurate are the graduations on a beaker?
2. Compare and contrast the accuracy and precision allowed by a graduated cylinder, beaker, and pipette.
3. Why should you never mouth pipette?

Part 2: Melting Point Determination of Organic Solids

Substances are identified by their properties. Many substances have the same property, but no two substances have the same set of properties. For example, a number or substances either boil at 61^{o}C or freeze at -63.5^{o}C, but only chloroform boils at 61^{o}C and freezes at -63.5^{o}C. Several properties of a substance, not just one or two, must known to positively differentiate on substance from another.

In identifying solids, melting point is commonly one of the properties measured. This is particularly true with organic solids. Organic compounds are covalently bonded composed primarily of Carbon. Only weak intermolecular forces exist between one molecule and those surrounding it in the

same sample. Relatively low temperatures are needed to overcome these forces. As a result, almost all organic compounds melt at temperatures below 400°C, which can be easily obtained with a Bunsen burner. By contrast inorganic solids generally have much higher melting points. This is because such solids are ionically bonded, and high temperatures are required to disrupt the bonds during melting. Sodium chloride, for example, melts at 801°C. In this part of the lab, you will conduct a procedure that is commonly used for determining melting points of organic solids.

Apparatus and Materials

ring stand	Bunsen burner	safety goggles
utility clamp	rubber band	lab apron
one hole rubber stopper	watch glass	organic solids
thermometer, -10 to 250°C	capillary tubes	

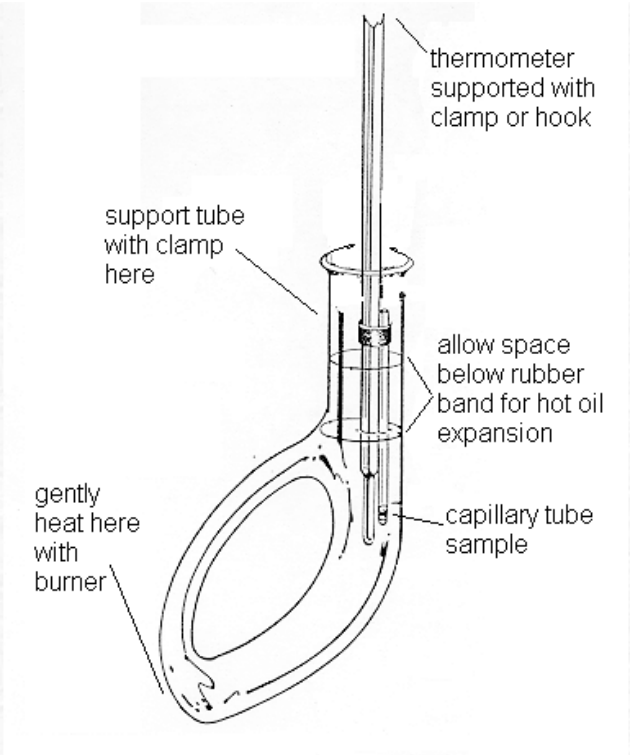
Procedure

1. Fill the capillary tube with the sample located in the fume hood. Tap the open end of the capillary tube on the solid, making some of it go into the tube. (If both ends of the tube are open seal one end in a Bunsen burner flame.) Turn the tube over and gently tap it on the table until the sample is in the bottom of the capillary tube. You can use a long piece of glass tubing to drop the capillary tube.

Caution: If your thermometer should ever break, immediately notify your instructor. Your teacher will clean up the spill and the broken glass.

2. Attach the capillary tube to the bottom of the thermometer so that the sample, in the bottom of the capillary tube, is at the same height as the thermometer bulb. Use a small rubber band to accomplish this.

3. Fill the Thiele tube with oil, as shown below, and clamp it to the ring stand above the burner using a utility clamp. Use the thermometer clamp to clamp the thermometer in place, so that the bulb and sample are level with the upper branch of the Thiele tube's side arm.



4. Read the temperature of the oil to the nearest 0.1°C. Have your instructor check your reading, and record this reading on your data table.

Caution: Hot oil can spatter or ignite if heated too quickly or too strongly. Exercise great care in heating the oil.

5. Light the burner with a very small flame and heat the oil while watching the sample in the capillary tube. The temperature should rise by only 1-2 degrees per minute. Move the burner back and forth to get even heating.
6. As soon as the first crystal melts record the temperature. When the rest of the sample melts, read and record the temperature on the thermometer, to the nearest 0.1°C. This is a melting range.

5. Turn off the burner and allow the oil to cool. Then repeat the process for a second trial.

6. Clean up and return your materials. Be sure that everything from the experiment has been returned to its place, and that your lab area is left clean.

Caution: Be careful not to burn yourself on hot glass or metal. Hot objects look just like cold objects. If any materials are too hot to handle, notify your instructor.

7. Wash your hands and return to your seat. Do not remain in the laboratory after you have finished the experiment.

Questions:

1. Define the term melting point.
2. Why do we have to use a melting range as opposed to a melting point?
3. Explain why water is unsuitable for use as a liquid bath in this experiment.
4. Using the CRC handbook, look up how close your measured melting point is to the actual melting point. Comment on why your measurement is different. Is your sample pure or not?
5. Calculate the percent error for the melting temperatures obtained in the experiment.

Answer all questions in your laboratory notebooks.